

CLAIMS

1. A twisted waveguide comprising first and second rectangular propagation path elements having different planes of polarization; and a connection element connecting the first and second rectangular propagation path elements together,

wherein the connection element has a fixed line length in a direction of electromagnetic-wave propagation of the first and second rectangular propagation path elements, and wherein the connection element includes projections projected inward so as to face each other, the projections concentrating an electric field of an electromagnetic wave entering from the first or second rectangular propagation path element and rotating a plane of polarization of the electromagnetic wave propagating through the connection element.

2. The twisted waveguide according to Claim 1, wherein an inner periphery of the connection element surrounding a central axis extending in the direction of electromagnetic-wave propagation of the first and second rectangular propagation path elements includes surfaces substantially parallel to H plane and E plane of the first rectangular propagation path element, said surfaces forming a staircase such that abutting sections between the surfaces parallel to

H plane and the surfaces parallel to E plane constitute the projections, the staircase being inclined in a direction corresponding to a direction in which H plane of the second rectangular propagation path element is inclined.

3. The twisted waveguide according to Claim 2, wherein the projections comprise two projections provided at two positions, wherein a plane extending between the two projections is inclined towards E plane of the second rectangular propagation path element with respect to E plane of the first rectangular propagation path element.

4. The twisted waveguide according to any one of Claims 1 to 3, wherein the line length of the connection element in the direction of electromagnetic-wave propagation is substantially  $1/2$  of a guide wavelength with respect to a frequency of an electromagnetic wave to be propagated through the connection element.

5. The twisted waveguide according to any one of Claims 1 to 4, wherein the connection element comprises a plurality of subelements disposed at multiple positions in the direction of electromagnetic-wave propagation.

6. A wireless device comprising the twisted waveguide

according to any one of Claims 1 to 5; and an antenna connected to one of the first and second rectangular propagation path elements included in the twisted waveguide.